

Geothermal pipe spacer

**ΩMEGA<sup>©</sup>**  
**EZ-Snaps. 60125**

# MANUAL & SHOP DRAWINGS



Greetings,

Geo-Air Industries inc. is proud to present its new line of geothermal spacers: the **Omega EZ-Snaps**

Designed to optimize borehole energy performance, EZ-Snaps simplify and accelerate installation, compared to other spacer models. Its advantage resides mainly in its capacity to receive a tremie pipe at any time during or after loop installation. The EZ-Snaps equally permits the temporary tremie pipe removal and its subsequent reinsertion (when faced with an important fracture needing to be sealed).

EZ-Snaps is **reliable**, **faster** and **environmentally friendly**. Finally, not only is the EZ-Snaps a 100% North American made product, it **costs less**.

You will find herewith all **relevant** documents for the selection, the installation and the use of EZ-Snaps. You will also find a **Typical Installation Specification** section for this product.

Geo-Air Industries thanks you for choosing its avant-garde products designed for the better of geothermics. Do not hesitate in calling us for further information.

Yours sincerely,

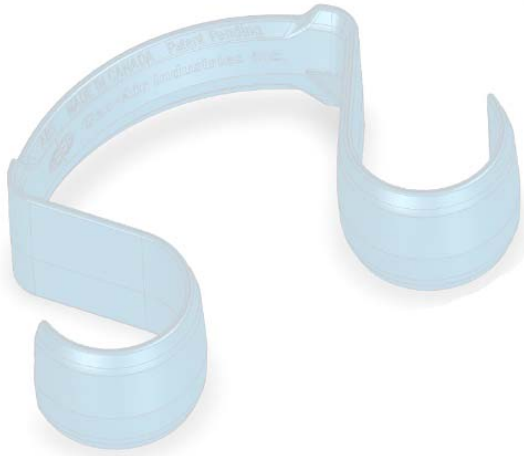
A handwritten signature in blue ink, appearing to read "Patrick Lambert", is written over a horizontal line.

Patrick Lambert, ing.  
President



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Geothermal pipe spacer

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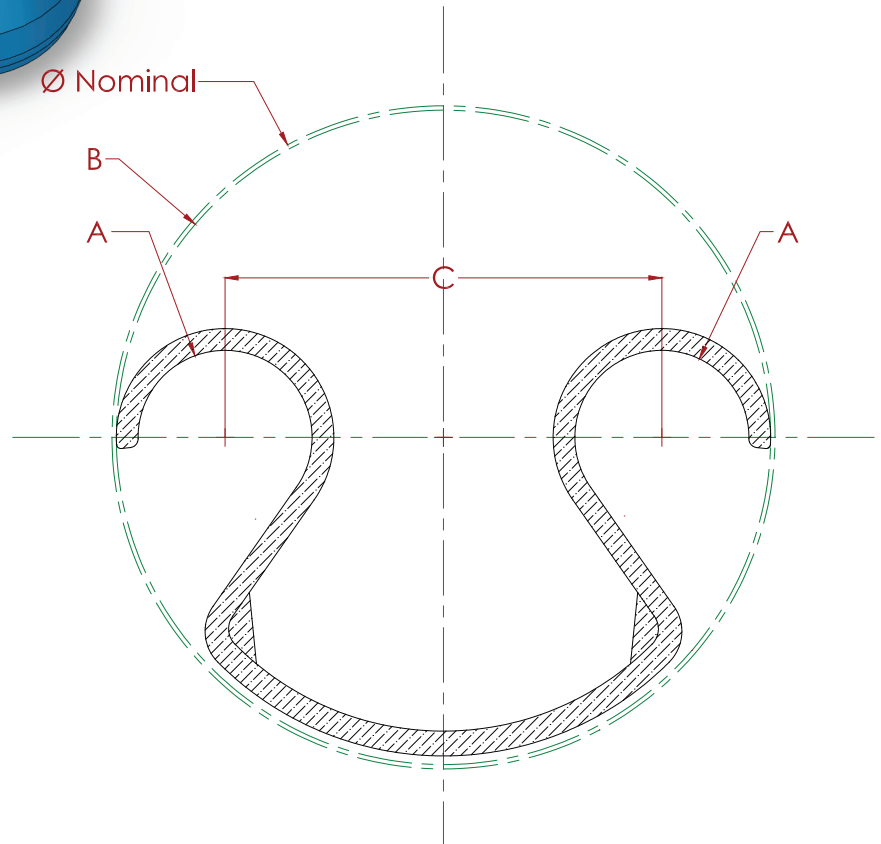
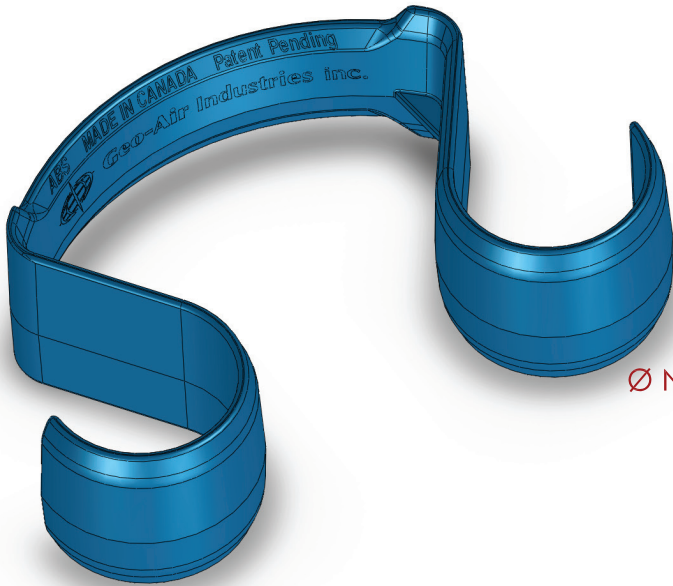
# SHOP DRAWINGS

# Geothermal pipe spacer

## ΩMEGA<sup>®</sup>

### EZ-Snaps.

# 60125



- \_ Model : 60125
- \_ Building material : virgin ABS
- \_ Dye : Blue n° 3005C
- \_ UV treated : no
- \_ Weight : 65 grams
- \_ Quantity per box : 200 units
- \_ FOB: Valcourt - QC - Canada
- \_ Made in Canada

Borehole nominal dimension (in)	Pipe nominal dimension (in)	Nominal $\varnothing$ (mm)	A (mm)	B (mm)	C (mm)
6	1.25	152.4	40	150.4	100.4
5.5	1.25	139.7	40	139.7	89.6

Notes:



[www.ez-snaps.com](http://www.ez-snaps.com)

1351, Gay-Lussac, Boucherville, QC, J4B-7K1  
 Tel.: 450-449-9559 Fax.: 514-221-3243  
[www.geoairindustries.com](http://www.geoairindustries.com)

## **Product definition :**

**The Omega EZ-Snaps** is a model of geothermal pipe SPACER. By SPACER we understand the following definition: A spacer is a rigid piece connecting two or more other pieces and maintaining a predetermined spacing between these connected pieces.

The *EZ-Snaps* was developed for use in geothermic systems using closed loop heat exchangers (GHX). More particularly, an *EZ-Snaps* is used to maintain the GHX pipes as close as possible to the borehole wall in which the exchanger is placed. This **increases the energy performance** of the said GHX, **reduces its length** and **substantially increases geothermal borehole installation productivity**.

## **Field of application:**

A closed loop GHX is used to extract ground thermal energy. Heat exchange occurs by the circulation of a fluid in a pipe composing the closed loop. The said pipe has both a supply and a return normally located in the same borehole or trench. The supply and return are connected via a “U” shape joint (U-Bend) at the bottom of the borehole: This comprises the loop. A vertical GHX is normally made up of High Density Polyethylene (HDPE) piping. This piping has a certain flexibility and memory of its coiled shape. During the installation of a vertical GHX, gravity tends to force the pipes to curve and bend, to interlace and to lean against themselves or against the borehole wall. The borehole is normally 150% - 200% larger than the diameter theoretically necessary to insert the loop.

## **Theory behind its application:**

The length and scale of a geothermal borehole field is determined by heat exchange formulas based on multiple parameters. The main elements dictating the scale of a geothermal field are the following:

1. Thermal loads to be dealt with (Building, process, etc)
2. Underground geological conditions (soil and rock type, density, water content and average temperature)
3. Design temperature and properties of the GHX liquid used
4. Borehole geometrical configuration (borehole size, pipe size, PIPE SPACING and THEIR RELATIVE PROXIMITY to the borehole wall)
5. Pipe and grout thermal properties



For environmental and technical reasons (as dictated by the Canadian Standard for the Design and Installation of Earth Energy Systems; CSA C448-2), it is required to fill the space around the loop with a grout mixture. This grout is mainly an insulating barrier for the prevention of groundwater contamination. However, this grout also represents an additional thermal resistance.

Any grout located between the pipe and the borehole wall causes a decrease in the borehole's energy efficiency (i.e. it increases the overall borehole thermal resistance) and thus requires an increase of the borehole's length. Interlacing , and the relative proximity of the loop supply and return pipes, contribute in reducing the geothermic exchange effectiveness (heat exchange with the ground) by increasing thermal interference between the supply and return pipes of a borehole and by creating contact points between them. i.e. thermal energy is exchanged between the pipes and not entirely with the ground. Consequently, this increases the borehole's thermal resistance and requires an increase of its length or an increase of the number of necessary boreholes.

For a given project (thermal loads), at a determined site (geological conditions), there are only a few elements one can influence in order to optimize the design and the thermal effectiveness of a GHX field. One of these elements is the pipe spacing within a borehole. In order to maximize heat transfer effectiveness, it is necessary to distance the supply and return pipes from each other as much as possible while bringing them as close as possible to the borehole wall. This reduces their reciprocal thermal interference while reducing the induced grout thermal resistance.

The first purpose of an EZ-Snaps is to play this role.

As a secondary purpose, an EZ-Snaps improves the driller's productivity by reducing their risks and facilitating their work in general.

## **Advantages with using the Omega EZ-Snaps:**

There exist, on the market, some other models of geothermal pipe spacers. On the other hand, most have certain characteristics which make them less interesting to handle. EZ-SNAPS has been specifically developed to solve the main problems inherent to other models of geothermal pipe spacers:

- An EZ-Snaps is produced according to various specific borehole diameters and PASSIVELY maintains spacing between the pipes; An EZ-Snaps does not exert pressure on the pipes to separate them. The stiffness of an EZ-Snaps firmly maintains the distance between the pipes. Nevertheless, an EZ-Snaps has a certain elasticity enabling it to adapt to the occasional geometric anomalies of a borehole as well as commonly expected borehole diameter variations.
- An EZ-Snap is composed of a single rigid non corrodible part. The quality of plastic (the ABS used in its design) as well as the thorough study of its shape and curvature radius make it a particularly resistant product. Its shape was carefully studied in order to fulfill solidity, durability and handiness prerogatives.
- An EZ-Snaps maintains its integrity, even when subjected to the roughest construction site conditions. The EZ-Snaps was foreseen to slide along the borehole wall without adversely affecting its integrity, unsnapping or risking breakage. Moreover, if there is contact with the borehole wall during descent, it is the EZ-Snaps that will be submitted to scratching, thereby protecting the HDPE pipe. The geometric shape of an EZ-Snaps' edges is such to allow the best slippage along the borehole wall. Even if there is friction throughout insertion, which is foreseen, the EZ-Snaps is designed to preserve its integrity throughout the descent and until it is in place, without any significant slippage along the pipe or unsnapping from it.
- The EZ-Snaps' shape is designed to hold the pipes in place no matter what occurs during descent in the borehole. By way of the EZ-Snaps' « Omega » shape, if a pipe were to detach from a pipe receptacle, it would remain in place between the EZ-Snaps and the borehole wall.
- EZ-Snaps, having no movable parts, cannot be dismantled into separate pieces. Furthermore, being composed of a single piece, an EZ-Snaps does not produce any wasted material on the construction site. In fact, even its packaging is entirely recyclable.



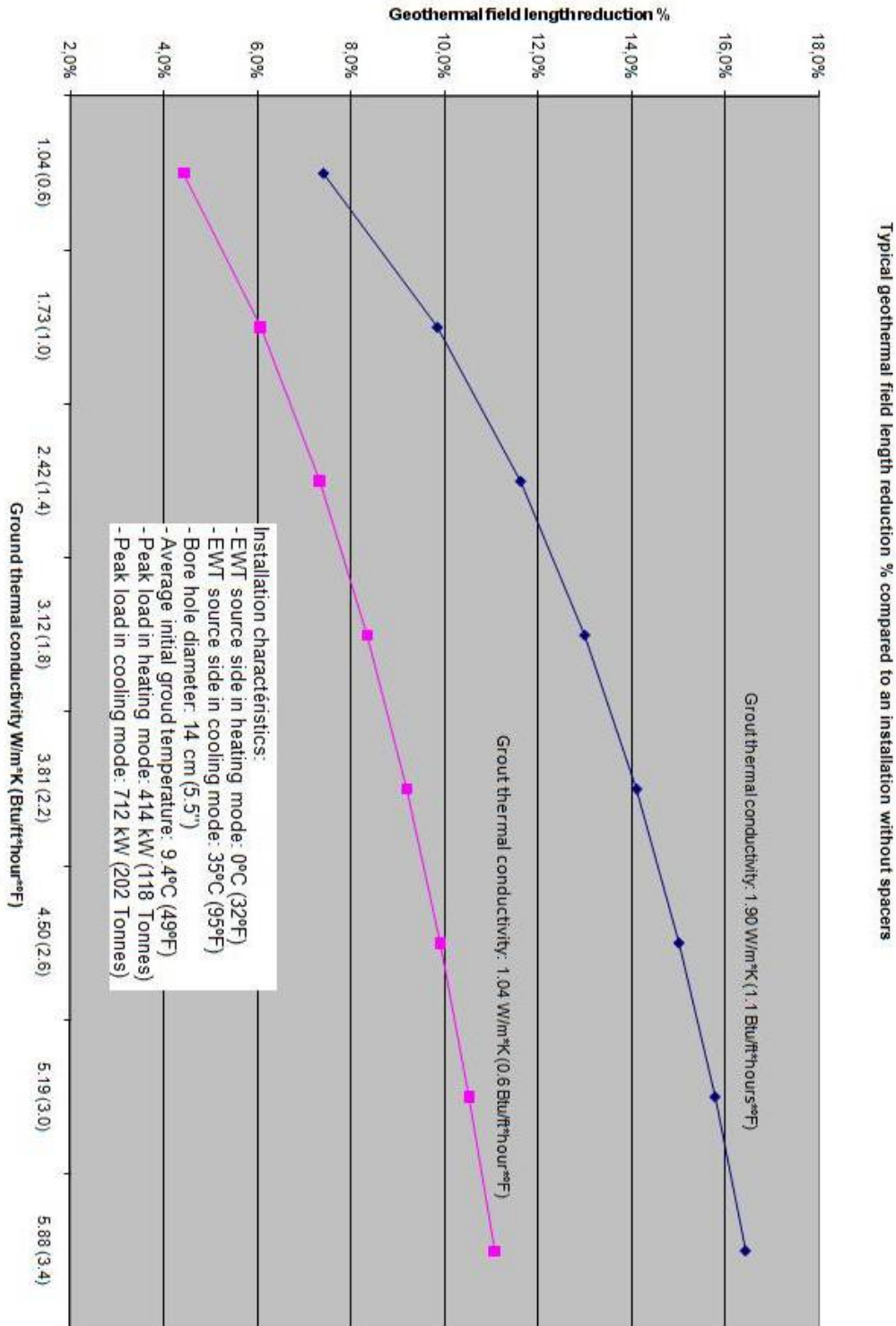
- **One preferred characteristic:** The EZ-Snaps does not require the presence of a tremie pipe for its insertion in the borehole and does not subsequently encumber the tremie pipe descent. Productivity is maintained without any modifications to usual working methods in geothermics.
- The EZ-Snaps is designed to maximize the open access space in a borehole, in order to allow for the GHX insertion WITHOUT the presence of a tremie pipe. It is therefore possible for the installer to insert the geothermic exchanger into the borehole as early as possible, independently of grouting equipment, and this while reducing the installer's economic losses due to on site standby equipment. The EZ-Snaps' distinctive shape permits the tremie pipe to slip passed it rather than to hook onto it. This equally permits temporary retrieval of the tremie pipe and its reinsertion later on. This is particularly useful when faced with large fractures that need to be plugged with a sealant.
- Handling of the EZ-Snaps, in order to connect it to the GHX pipes, is accomplished in a single gesture: the worker positions it and, in one jerking movement, "snaps" it into place. There are no parts requiring removal to actuate it, no spring and no moving parts: nothing of the EZ-Snaps can dislodge or fall off. Connection of an EZ-Snaps to the exchanger pipes can be accomplished with the use of a single hand. EZ-Snaps testing demonstrated the ease and the workers preference to install EZ-Snaps compared to other types of spacers
- The usefulness and manipulation ease of the EZ-Snaps make it possible to reduce the risks of extra charges on commercial projects.
- The EZ-Snaps is patent pending throughout North America.



## **Geothermal Exchanger Optimization:**

As mentioned above, the use of EZ-Snaps helps in reducing geothermal borehole field size by greatly contributing to the reduction of borehole thermal resistance ( $R_b$ ). This reduction is dependant on a number of geological and geometrical factors. We cannot present every possible combination of these factors here. None the less, the following table, based on a typical commercial project (when looking at the thermal loads profile), presents potential borehole length reductions (as compared to not using EZ-Snaps), as a function of various grout and soil conductivities.

**Figure 1: Typical borehole length reduction potential**



This graph presents, for this specific commercial instance, a geothermal exchanger length reduction of up to 16.5%. **Other scenarios can produce even greater results.**

## Installation method:

The installation method is simple and efficient. At the end of this document, you will find a visual installation method in the form of an intuitive picture strip.

- 1- When the geothermal field is ready to receive the GHX, the geothermal loop installer positions his loop reel so that the pipe unwinds directly into the borehole.
- 2- If needed, a fly wheel can be installed on the edge of the borehole casing to aid in guiding the pipe into the borehole.
- 3- Adjust the insertion angle so that the EZ-Snaps do not catch the casing edge. If needed, install a retaining guide on the casing opposite the fly wheel so the EZ-Snaps can slide into the borehole without catching the casing edge.
- 4- Install a sufficiently sized weight to the end of the loop to ease in its insertion without a hitch. Normally, for a 6" (15cm) diameter **water filled** borehole, a minimal 110 lbs (50 kg) weight is recommended. Depending on borehole depth and water content, this weight must be adjusted. However, if a 5.5" (14 cm) borehole is used, the weight must be increased by 50% or to 175 lbs (80 kg).
- 5- Once the weight in place and all equipment secured, start inserting the loop.
  - a. At each increment as specified in the drilling specifications (normally 10' or 3.3m), install one (1) EZ-Snaps.
  - b. With one hand, take one EZ-Snaps, holding it similarly to how you would hold a telephone handset (i.e. by its main arch in such a way that your fingers wrap around the inside of the main arch and your palm is on the outside of the main arch).
  - c. In one movement, pivot the EZ-Snaps so its pipe receptacles are vertically positioned in relation to one another. Pass the EZ-Snaps between the loop's supply and return pipes and pivot the EZ-Snaps once again so its pipe receptacles are now horizontally positioned in relation to one another. Pull back on the EZ-Snaps while snapping it into place on the loop. A characteristic sound should be heard ("SNAP ! – SNAP !") i.e. the loop supply and return pipes have snapped into the EZ-Snaps' pipe receptacles.
  - d. Let the pipe descend until the next increment and redo steps b+c.
  - e. It should not be necessary to interrupt or slow down pipe descent to install an EZ-Snaps.
- 6- During the entire insertion process, the installer must avoid letting the loop pipes cross over each other on the loop reel. This would cause the installation of some EZ-Snaps with their main arch on the opposite



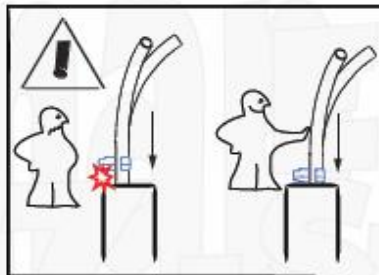
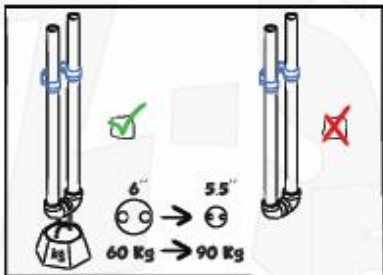
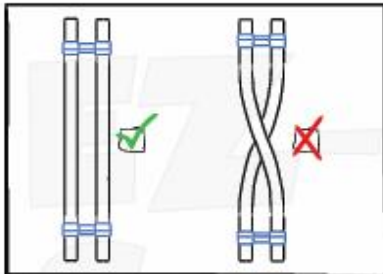
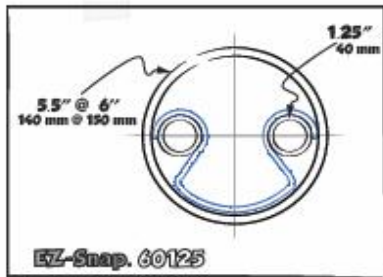
- borehole wall side as other EZ-Snaps in the same well. This is not desirable.
- 7- If the installer suspects, due to a strong impact with the casing edge or by manipulation error, that an EZ-Snaps has come loose from one of the pipes at casing edge, it is preferable to raise the loop and verify the EZ-Snaps is correctly in place.
  - 8- In the unlikely event an EZ-Snaps detaches from a pipe, this would happen at the top of the borehole, either by misplacing it on the pipe or by a serious impact with the casing edge. It is geometrically improbable that an EZ-Snaps would detach during descent, once in the borehole. None the less, if the installer notices a detached EZ-Snaps, it only needs to be put back in place.
  - 9- As in all geothermal loop insertions, the end of the insertion may require the installer and his/her helper to push on the loop pipes to aid in their descent. This is, among other things, due to the loop's positive buoyancy, inertia of the mass to be displaced, friction with the water surrounding the pipe and friction between the EZ-Snaps and the borehole wall.
  - 10- If the effort is superior to that normally required, it can simply be a case of working procedures adjustment for new EZ-Snaps installers. If the effort become excessive, a small increase in weight at the loop's bottom end is required. The ideal amount of weight will vary according to work site conditions and the installer's experience.
  - 11- EZ-Snaps are delivered in cardboard boxes of 200 units per box. For higher user-friendliness, each box contains 4 plastic bags of 50 units per bag.

Figure 2: Installation diagram

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**EZ-Snaps.**



**SIMPLY EFFICIENT**  
**SIMPLEMENT EFFICACE**  
**SIMPLEMENTE EFICIENTE**



  
**Geo-Air Industries inc.**  
 1351, Gay-Lussac,  
 Boucherville, QC, J4B-7K1  
 Tél.: 450-449-9559 Fax.: 514-221-3243  
 www.geoairindustries.com

## Typical installation specification:

### In the section: DOCUMENTS/SAMPLES TO BE SUBMITTED

- Canadian Geotexchange Coalition (CGC) drill log describing the geothermal grout used (as described by the recipe followed for the mixture), the different geological strata and their positions, the presence and technical characteristics of water table and aquifers, the penetration speed, **the number and interval of geothermal spacers used** and all other pertinent information, for the first borehole and an individual log for each subsequent borehole.
- Geothermal pipe spacers data sheet

### In the section : WORK EXECUTION :

- The filling material for the annular space between the vertical exchanger and the borehole wall shall be a water-proof sealant containing bentonite. It shall be a mixture of bentonite with high solids content (30% minimum, above freezing). The bentonite grout mixture must also have a maximum permeability rate lower than  $1.0 \times 10^{-7}$  cm/s as established by the method using a Flexible Wall Permeameter (described in the ASTM D5084-03 standard), recommended by the U.S. Environmental Protection Agency, to ensure adequate sealing. A report describing the procedure used to mix the product as well as the bentonite grout mixture components must be given to the main Engineer so that said Engineer can verify the bentonite grout's permeability.

The installation of the geothermal exchanger (loop) requires the installation of geothermal spacers calibrated for the specific borehole and pipe diameters used. These spacers will be installed every 10' (3.3m) along the pipe.

The spacer shall be made entirely of non-corrodible material. The type of spacer to be used shall allow withdrawal and reinsertion of the tremie pipe. It shall also geometrically favor supporting the pipe against the borehole wall. The recommended model is the Omega EZ-Snaps, model 60125<sup>1</sup> or approved equivalent<sup>2</sup>.

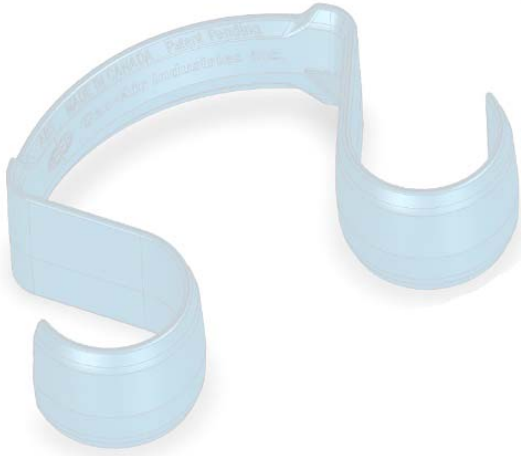
The Drilling Contractor shall submit to the Main Engineer a drilling report for each borehole, such as the one annexed to the present specification. This drilling report shall be filled and signed by the Drilling Contractor's guarantor. This drilling report shall include the following information:

- Borehole drilling date
- Borehole identification number
- Borehole depth reached
- Length of casing used (if any) and type of casing material
- Complete Drill log (Strata, water presence, penetration speed, etc.)
- Type/Make of bentonite and sand used
- Grout recipe followed
- Number of batches injected
- Depth of geothermal loop reached
- **Number of geothermal pipe spacers installed**
- Results from both (2) hydrostatic pressure tests
- Actual Purge flow rate and hydrodynamic pressure differential measured during purge
- Any and all other particular characteristics of the borehole subject of the current report.

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<sup>1</sup> For a 5.5" to 6" diameter borehole using 1 1/4" HDPE pipes

<sup>2</sup> For other borehole and pipe sizes, communicate with Geo-Air Industries representatives.



Geothermal pipe spacer

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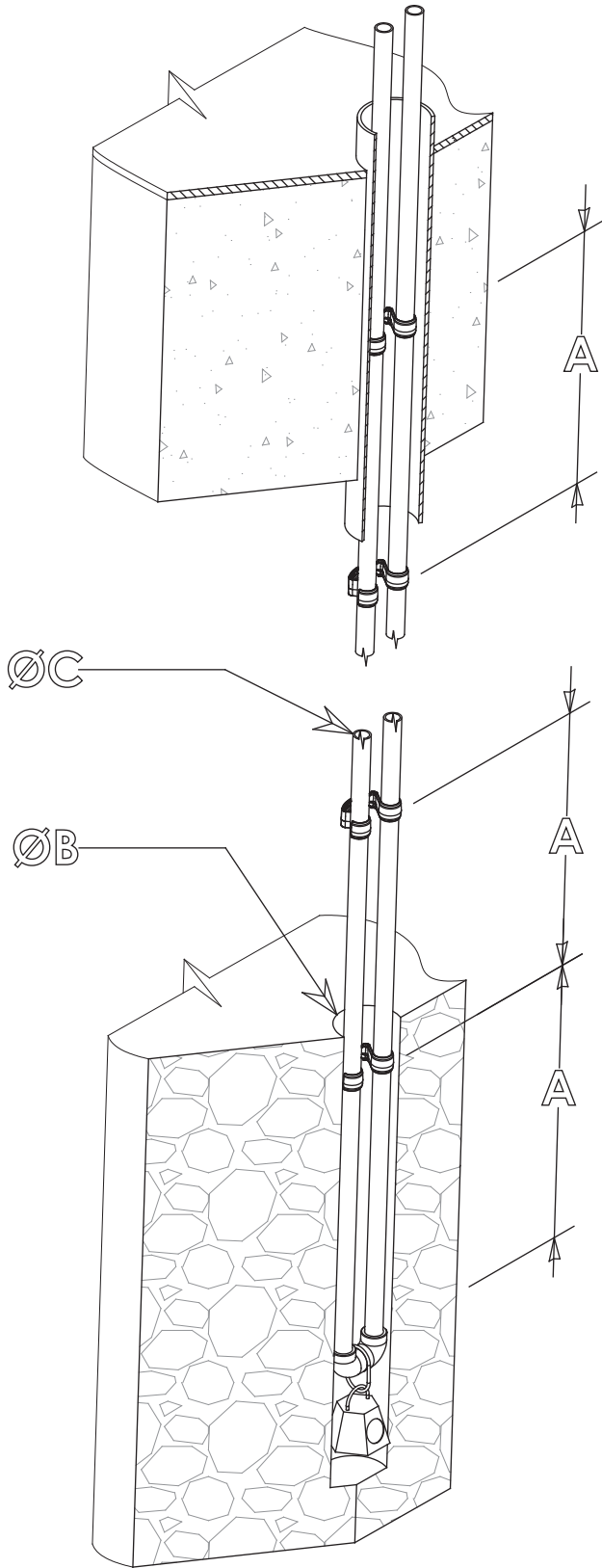
# INSTALLATION PLANS

# Geothermal pipe spacer

## ΩMEGA<sup>®</sup>

### EZ-Snaps.

# 60125



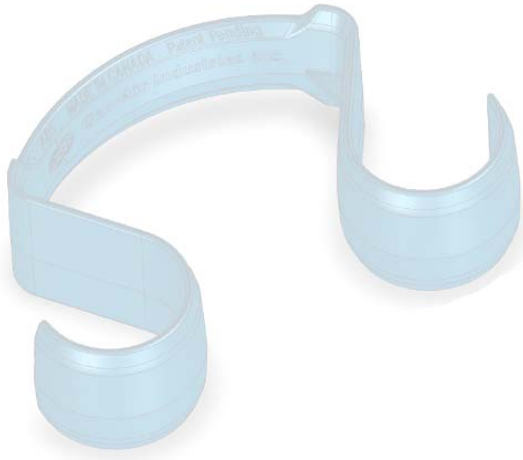
	A		ØB Nominal		ØC Nominal	
	ft	mm	in	mm	in	mm
<b>ΩMEGA EZ-SNAPS 60125</b>	10	3048	6	152,4	1.25	31,8
	10	3048	5.5	139,7	1.25	31,8

Notes:



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**EZ-Snaps. 60125**

# MATERIAL SAFETY DATA SHEET



91 Fitchburg Road  
Ayer, MA 01432  
978/772-0764

## MATERIAL SAFETY DATA SHEET

### ALL GRADES OF GENERIC PRIME ABS

Effective Date: Oct 30, 2009

#### Important:

PolyOne Distribution urges each customer or recipient of this Material Safety Data Sheet to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology or fire prevention, as necessary or appropriate to use and understand the data contained in this MSDS.

To promote safe use and handling of this product, each customer or recipient should (1) notify its employees, agents, contractors, and others whom it knows or believes will use this material, of the information on this MSDS and any other information regarding hazards or safety, (2) furnish this same information to each of its customers for the product, and (3) request its customers to notify their employees, customers, and other users of the product of this information.

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## I. IDENTIFICATION

PRODUCT GROUP: Acrylonitrile-Butadiene-Styrene

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## II. PHYSICAL DATA

Physical Form: Pellets

Color: Various colors

Odor: None

Boiling Point: N/A

Melting Point: 180°F-225°F

Specific Gravity: 1.05

Evaporation Rate: Negligible

Vapor Density: Negligible

Solubility in Water: Insoluble

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### III. HEALTH HAZARD DATA

Effects of Exposure: Occupational exposure to this material has not been reported to cause significant adverse health effects.

Eye Contact: Solid or dust may cause irritation or corneal injury due to mechanical action. It is good industrial practice to minimize eye contact. ANSI approved safety glasses are recommended.

Skin: Essential non-irritating to the skin. Mechanical injury only. Under normal processing conditions, material is heated to elevated temperatures; contact with the material may cause thermal burns. It is recommended that gloves should be worn to protect against thermal burns. No adverse effects anticipated by skin absorption.

Ingestion: Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

Inhalation: Dust may cause irritation to upper respiratory tract.

Carcinogenicity: None

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### IV. FIRST AID MEASURES

Eye: Flush eyes with plenty of water. If wearing contact lenses, remove lenses after a minute or two of flushing then continue flushing for a few more minutes.

Ingestion: Contact a physician.

Inhalation: Move to fresh air. If experiencing breathing difficulty, get medical attention.

Skin: If molten material comes in contact with the skin, cool under ice water or a running stream of water. Do not apply ice. DO NOT attempt to remove the molten material from the skin. Removal could cause severe tissue damage.

Note to Physician: Treat burns as any thermal burn after decontamination. No specific antidote

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## V. FIRE FIGHTING MEASURES

Flash Point: None  
Flammable Limits LEL: N/A  
UEL: N/A

Auto-ignition Temperature: N/A

Dust Explosions: Mechanical handling operations can generate combustible dust. To reduce the potential for dust explosions, do not permit dust to accumulate. Dense smoke is produced when product burns.

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include carbon monoxide, carbon dioxide, nitrogen oxides, and trace amounts of styrene and hydrogen cyanide.

Extinguishing Media: Water fog or fine spray, dry chemical fire extinguishers, Carbon Dioxide fire extinguishers, foam.

Special Fire Fighting Procedures. Full emergency equipment including self-contained breathing apparatus should be worn by firefighters. During a fire, irritating and toxic gases and aerosols may be generated by the thermal decomposition and combustion.

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## VI. ACCIDENTAL RELEASE MEASURES:

SPILL OR LEAK PROCEDURES: Pellets or beads may present a slipping hazard. Keep out of irrigation ditches, sewers, and waterways. Sweep up and collect in suitable containers.

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## VII. HANDLING AND STORAGE

Precautions to be taken:

Handling: When handling flaked material or during secondary operations, vent storage bins, conveyors, dust collectors, etc. Ground handling equipment. Keep open flames, sparks and heat away from dusty areas. Maintain highest standards of housekeeping to prevent accumulation of dust. Material should be stored in a clean, dry environment in sealed containers. Material must be dried before processing.

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## VIII. PERSONAL PROTECTION

**Ventilation:** Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits. Local mechanical exhaust ventilation should be used at sources of air contamination, such as open process equipment, or during purging operations, to capture gases and fumes that may be emitted. Standard reference sources regarding industrial ventilation (i.e.) ACGIH Industrial Ventilation) should be consulted for guidance about adequate ventilation.

**Respiratory Protection:** NIOSH/MSHA approved dust respirator recommended if the airborne dust concentration is near or exceeds the nuisance dust exposure limits. If ventilation is not sufficient to control processing gases and fumes, a NIOSH approved respirator should be selected and worn based on contamination levels found in the workplace.

**Eye Protection:** Safety glasses recommended.

**Skin Protection:** Protective clothing such as coveralls or lab coats should be worn. Launder or dry-clean when soiled. Gloves and boots resistant to chemicals and petroleum distillates also recommended. Heat protective clothing should be worn when handling heated materials.

**Additional Protective Measures:** The greatest potential for injury occurs when working with molten, polymeric resins such as during a purge of a molding machine, extruder and the like. During this type of operation it is essential that all workers in the immediate area wear eye protection and skin protection as protection from thermal burns.. Purging should be collected as small flat thin shapes or thin strands to allow for rapid cooling. Precautions should be taken against auto-ignition of hot, thick masses of the plastic. Quench with water. Grinder dust is an exposure hazard.

Fumes or vapors emitted from the hot melted plastic during converting operations may condense on cool overhead metal surfaces or exhaust duct. That condensate, usually in the form of a soft grease-like, semi solid, may contain substances, which can be irritating or toxic. Avoid contact of that material with the skin. Wear rubber or other impermeable protective gloves when cleaning contaminated surfaces.

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## IX. STABILITY AND REACTIVITY

Stability: Stable

Incompatibility: None known

Conditions to Avoid: Avoid temperatures above 572°F. Exposure to elevated temperatures may cause product to decompose.

Hazardous Polymerization: Will not occur.

Hazardous Decomposition Products: By fire or thermal decomposition: carbon dioxide, water, carbon monoxide, hydrocarbons, hydrogen cyanide, and some original monomers such as styrene and acrylonitrile.

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## X. TOXICOLOGICAL INFORMATION

Product may contain dust or particulates that may cause eye irritation or abrasion.

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## XI. DISPOSAL CONSIDERATIONS

Waste disposal method: Material may be incinerated or landfilled in compliance with federal, state, and local environmental control regulations.

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## XII. TRANSPORT INFORMATION

DOT Status: Not regulated

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The opinions expressed are those of qualified experts within PolyOne. We believe that the information contained is current as of the date of the Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of PolyOne Distribution, it is the user's obligation to determine the conditions of safe use of the product.



# Personal notes